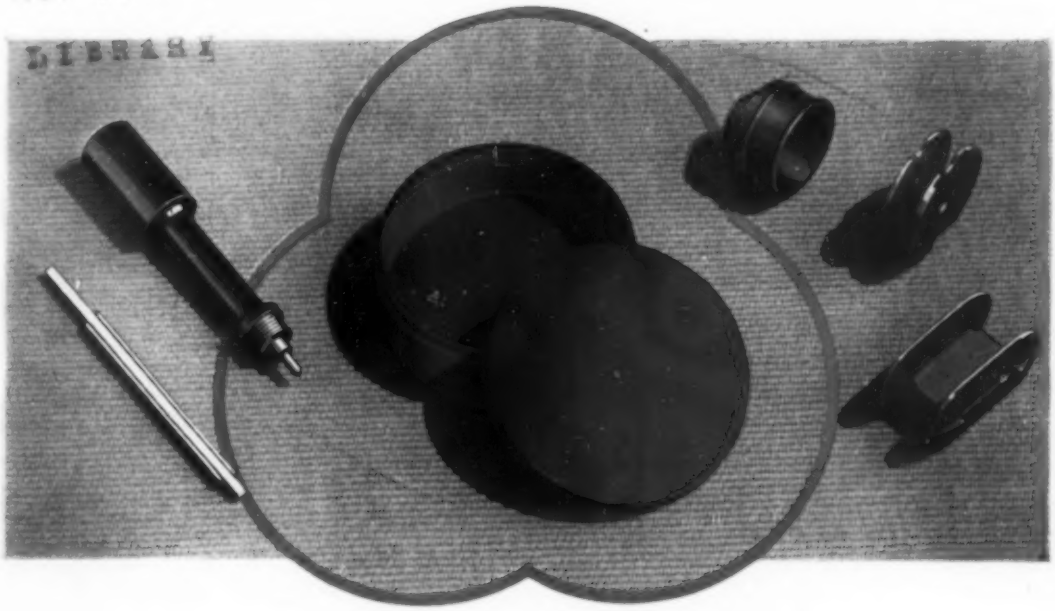
# PLASTICS

**A Periodical Devoted to the Manufacture and Use of Composition Products**



## NOVEMBER, 1926



# *The strength of Bakelite makes thin wall molding practical*

WHEN rigid strength in thin-wall parts is required, Bakelite molded usually meets the need. The several examples pictured above are slightly less than actual size, and give some idea of the possibilities of Bakelite molded for forming parts thin in section and accurate in dimension.

In two of these parts, the dielectric strength of Bakelite is also a factor. The slender tubular part at the left is from an electric mouth lamp and below it is shown the electrical conductor that passes through this Bakelite tube. The rod and the sleeve surrounding it are separated by a wall of Bakelite molded 1-64 inch thick. The second electrical part is the magnet core shown at the lower right.

The cooperation of our engineers and research laboratories is offered all those having molding problems to solve. Booklet No. 51, "Bakelite Molded," will be mailed promptly on request.

# *A better basis for quality products*


# KAROLITH

***Non-Inflammable — Non-Fading — Easily Worked***

HERE'S a better basis for quality products—a raw material that more perfectly approaches the brilliance and permanency of jade, coral, topaz, lapis lazuli, mahogany, horn, ivory, tortoise, amber.

The perfect material for screw machine work, embossing, jigging, milling, threading, slotting, sanding, drilling, tapping, shaping and rhinestone setting. Takes and holds a high polish on rag buff and tumbling barrel. Does not crack or crumble. Hence waste is reduced to the irreducible minimum. Cannot fade and is practically unbreakable. Odorless, tasteless and non-inflammable. Alcohol cannot damage it. Non-conductor of heat and electricity. Has any other raw material so many advantages?

Let us prove these advantages at our expense by making samples of your products in KAROLITH at our laboratories. Tear out this advertisement and ACT on it TODAY!

**KAROLITH CORPORATION**
**189-207 Thirteenth Street : Long Island City, N. Y.**

KAROLITH

PLASTICS. Vol. II, No. 11, November, 1926. Publication office 49 E. Washington Avenue, Washington, N. J. Executive office, 471 Fourth Ave., New York City, N. Y. by The Neckwear Publishing Company. Sylvan Hoffman, President. Subscription price, Domestic $3.00 per year, 35c per copy. Foreign and Canada, $4.00 per year. Entered as second-class mail at the Post Office at Washington, N. J., under the Act of March, 1879, and copyright, 1926, by The Neckwear Publishing Company.

# DUREZ

MADE with DURable REZin, the most talked of plastic of this plastic age.

Who are better able to judge the quality of any plastic than the molders of that Plastic?

Molders of Durez prefer it because they have found that the molded object is made better and with greater facility.

The growth and use of Durez since its inception has been phenomenal.

Its success is the inevitable result where real quality and greater value are offered with good service.

Write for samples or information regarding possible applications.

DUREZ

## GENERAL PLASTICS
INCORPORATED
NORTH TONAWANDA, NEW YORK

# DUREZ

# Aladdinite

# 1st in U.S.

## The Modern Aladdin

Has found perfection in Aladdinite, the first casein solid manufactured in the United States. The beautiful finished hues it may be obtained in; mottled or solid, buffalo horn or tortoise shell, all strong and durable; together with the fact that Aladdinite is **inexpensive, sanitary** and **non-inflammable,** makes it the ideal casein plastic. Insist on Aladdinite. Further information gladly furnished.

## Alladdinite Co., Inc.

ORANGE, N. J.

ALADDINITE

BEGINNING with this issue, PLASTICS again increases the number of pages in the publication.

This was done because the added number of advertisements would have crowded out the text material unless these additional pages were included.

We feel proud of the support that the industry has accorded this publication both in its advertising and subscriptions.

The number of inquiring letters about all manner of subjects is evidence of the fact that PLASTICS is looked upon as a clearing house for information about the industry.

We assure our readers that we intend keeping up our full editorial content in proportion to advertising and that we will always try to render a complete service of informative value.

---

So, if you wish to be informed of all that is new in this rising industry of PLASTICS in general, it behooves you to become an active reader of all the literature on the subject. Unfortunately most of it has been scattered through dozens of publications, many in a foreign tongue. PLASTICS, however, now offers it to you in a language which you can understand, and with the highly technical and involved type of utterance symptomatic of the research worker re-cast into the common idiom. Our circulation is rapidly growing, in fact most of the back numbers of our magazine are completely out of print. To be assured of having a complete file of PLASTICS you should be a subscriber.

It is important also that you obtain the Plastics Directory, Index and Buyers' Guide which will be issued in December. As indicated, this Directory will have a complete cross reference for the easy location of any article that may have appeared for the past fifteen months in this magazine.

*The Publishers.*


# PLASTICS

**A periodical devoted to the manufacture and use of plastic and composition products**

**Vol. 2** **November, 1926** **No. 11**


## *Contents*




Carl Marx, B. Ch., Editor
William Grunstein, E. E., Associate Editor
William C. Segal, B. S., Associate Editor
Publication Office: Washington, N. J.
Offices: 471 4th Ave., New York. Telephone Ashland 0568
360 N. Michigan Ave. Chicago, Ill.
SYLVAN HOFFMAN, Man. Editor. ALAN COHEN, Adv. Director
Issued Monthly
35 cents a copy
Subscription Price
U. S. $3.00, Foreign $4.00 Per Year

# PLASTICS

A periodical devoted to the manufacture and use of plastic and composition products

Vol. 2 NOVEMBER, 1926 No. 11


# Production Methods in Molding

## Proper equipment and skill in laying out the work increases the efficiency of manufacture

*By Fred R. Daniels*

*The actual methods used by a large custom molder are always of interest to all who are confronted with the problem of producing economically large quantities of molded goods, hence the present article will be especially welcome as it gives the details so essential to success.*

LARGE quantities of molded products are used in radio equipment. Many of these are molded with brass inserts to provide means for electric circuit connections in radio instruments. Although the main purpose of employing molded materials so extensively in radio instruments is to furnish adequate electrical insulation, numerous molded parts are also used to control knobs and handles. This article contains two examples of molded work having metal inserts, and two examples in which inserts are not used, but which are good examples of molding radio parts. The practice described is that of the *Shaw Insulator Co., Newark, N. J.*

The materials commonly used for this purpose are Condensite, Redmanol, Bakelite, Formica, Electrose, etc.—all condensation products of phenol and formaldehyde—and shellac compositions. The first class of materials is prepared both in powdered form and in sheets of about ¼-inch thickness, but the shellac compositions are made in sheets only. The powder is used in "closed" or "positive" molds that is, molds into which charges of powder are placed that will exactly produce the desired part without any overflow. The "open" or "negative" mold, on the other hand, is one in which sheet stock is used; here the lower die cavity is surrounded by an overflow channel into which the excess material is forced as the cavity of the die is filled under pressure. This overflow is a total loss, as it cannot be used again. On removing the parts from negative dies, they are usually surround-

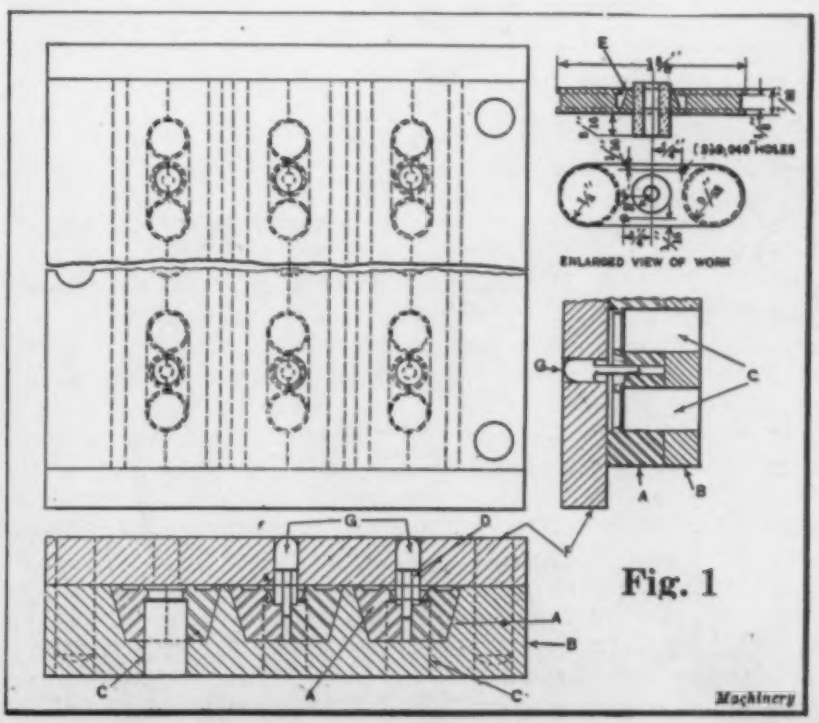



Fig. 1

*Enlarged view of phenol-resin bobbin and dies in which it is molded.*

ed by a liberal flash and in some cases, where the filling out of the piece is difficult, this flash will be heavy enough to hold an entire string of parts together.

There is also what might be called a "semi-positive" method of molding in which the molded product used is also in sheet form, but the pieces of material used are carefully weighed to agree with the weight of the finished article. This practice, however, is followed only in cases where the design of the die is such that the amount of overflow must be limited because it is impracticable to provide a large overflow channel in the die.

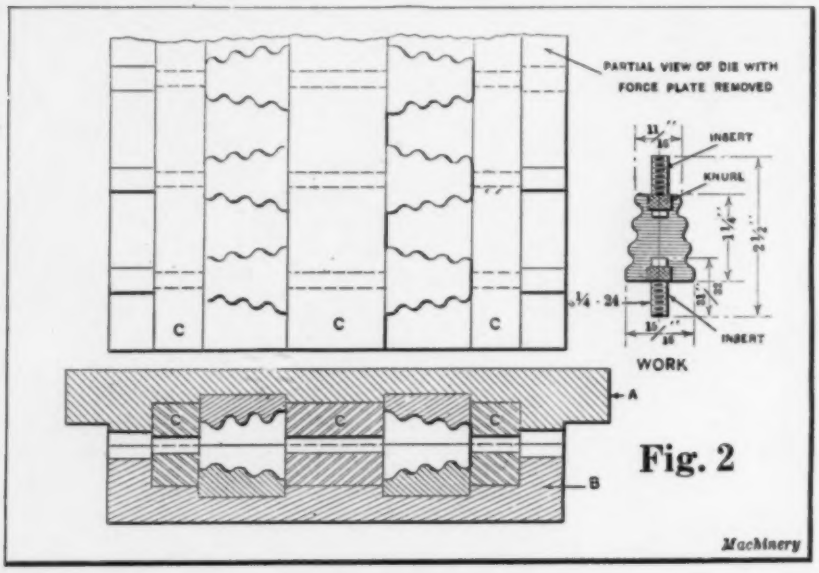



Fig. 2

*Dies used in molding insulators for variable condensers.*

The principle employed in the making of molded insulator parts is that of combined heat and pressure; pressure is supplied by a hydraulic press, through a pump and accumulator, and the heat by live steam. In the practice described, Watson-Stillman hydraulic presses are used which are designed to furnish a pressure of 2000 pounds per square inch. For heating the platens of the press between which the dies are placed, a live steam pressure of 90 pounds is regularly used, which gives a temperature of 320 degrees F. The combined heat and pressure are applied for variable lengths of time, the duration depending on the size and sectional area of the part being molded. The steam is not passed through channels in the dies (as is sometimes done) but is conducted to the dies by contact with the hot platens. The dies are prepared for the press on heated tables or workbenches made of iron, so that they are not cold when placed in the press but already hotter than the bare hands can stand.

### Molding Small Bobbin Having Brass Insert

The first example of molded work to be considered is that of a condensite bobbin made for the American Radio & Research Corporation. The bobbin is used as a vernier adjustment in connection with variometers; an enlarged view of the finished product is shown in the upper right-hand corner of Fig. 1. The main point of interest in connection with this job is the construction of the dies, this being a job known as a "side-draw" job, that is, on account of the flanges which surround the spool portions of the bobbin, it is necessary to draw the sections between the flanges from each side. This calls for the use of pairs of bars A which are set into the base plate B of the die at each of its three stations.

Each of the three pairs of bars A has accommodation for three bobbins and each pair encloses three pairs of plugs C which form the bottom surface of the spools. Between each pair of semicircular holes in these bars, is a countersunk opening leading to a hole which passes through them. Each countersunk hole furnishes a seat for a brass insert D and leaves a cavity around the end of the insert so that the material may be built up around it and reinforce it as indicated in the view of the work at E. The bars A are furnished with a shallow channel which surrounds the die openings, this being necessary in a negative mold, and is the provision for receiving the overflow material.

The top of force plate F carries three dowel-pins by means of which it is aligned with the base plate, and in this force plate there are holes directly over the countersunk holes in which the inserts are seated in the bars A. Each of these holes provides accommodations for a protector pin G which not only serves to prevent the molded material from entering the central hole in the insert, but also acts as a pilot to position the insert vertically and correctly. The force plate is made of hardened tool steel; the base-plate of unhardened tool steel; the bars of Ketos steel, hardened; the plugs C and the protector pins of drill rod.

### Preparation of the Mold

After the dies are taken from the press they are placed on the steam-heated table or workbench where the removal of the work and the loading of the dies is done. In preparing the mold, the condensite sheets are broken into pieces of approximately correct size, which can be readily determined by the skilled operator, and these are laid on a cloth where they are warmed by the hot plate. The bars A are first located in the base plate

(*Continued on page 402*)

# Remarkable Versatility of Pyroxylin

## Several hundred known and published uses of plastics based on this material make interesting reading

*By William C. Segal*

THE information dealing with the pyroxylin plastics, especially from the practical, manufacturing standpoint, has been so scattered in the literature, that it is almost impossible for any one individual to have on file anything which might be considered even a representative line of references to the subject.

Innumerable patents have been taken out here and abroad on almost countless objects and products in which the pyroxylin plastics play a major role. While it is a relatively easy matter to look up the chemical side of the manufacture of the pyroxylin plastics, and perhaps to get some data on the production of the raw material, as sheets, rods, tubes, blocks, etc., the effort involved to obtain information upon what the pyroxylin plastics have been used for in the past is very great.

### Technology of Cellulose Esters

However, be that as it may, at least one worker in this field has had the courage to tackle this prodigeous job. Starting more than twenty-five years ago he began gathering patents, journal articles and books upon the subject of pyroxylin and the pyroxylin plastics. His efforts were finally given to the world in the form of a highly-detailed and masterly arranged series of volumes which bear the title "Technology of Cellulose Esters," and which were published in 1920. Due to the great effort involved and the exceeding complexity, and despite the enormous amount of information crammed into the smallest possible space, the first volume of the series alone ran into five parts, or five separately bound books, all of which constitute but Volume I of a projected series of ten volumes.

*All who entered the recent contest should be highly interested in this list of uses of pyroxylin plastic as culled from the index of the most comprehensive book on the subject. Only those who have ever engaged in getting together information of this type can realize the amount of labor involved.*

The man who did all this is Dr. Edward C. Worden, of Millburn, N. J. Needless to say, it required the combined efforts of many highly trained assistants to produce this work, which was finally put into the form of the finished volumes in the remarkably short space of one year. Taking everything into consideration, the price asked for these volumes, $40.00, is exceedingly low, and actually less than the cost of production. A complete review of this work appeared at the time of its first publication, in Chemical Age, (N. Y.), and it would lead us to far afield to again review it here.

### What the List Means

What we do wish to point out to the readers of PLASTICS, however, is the type of information contained in these volumes. That is especially timely in view of the recent contest. Just to show what has been done with the pyroxylin plastics alone, we are reproducing, with permission, an alphabetic list of all the uses known and *published* prior to the appearance of Worden's work in 1920. This will be especially interesting to those who sent in suggestions. If there are any who contemplate sending in further suggestions, which they believe to be novel, it would be well to first check it against this list.

While we are here only giving a list of the uses, it should be pointed out that the book itself gives the name of the inventor or writer of the article, as well as the patent number or specific reference to the publication where detailed information on that particular item is to be found. That is where the chief value lies. No details are given in Volume I of "Technology of Cellulose Esters," as this is intended purely as a bibliography on this highly ramified art.

The pyroxylin plastics, under the generic heading of "Celluloid," are stated to have been used for the following:

### Pyroxylin Plastics Have Been Used for

Accumulators
Adhesives
Agglutinating bristles
Antiseptic pencil
Artificial ears
Artificial eyes
Artificial flowers
Artificial horn
Artificial limbs
Artificial pearls
Artificial whalebone
Attrition sheets
Aviator's helmet

Baby comforters
Baby soothers
Balloons
Balloon sheets
Balls, ping pong
Bandages
Bangles
Barette
Bas reliefs
Beads
Belt
Belt fastener
Bicycle pedals
Billiard balls
Billiard chalk holder
Bodice fastening
Boot uppers
Bracelet
Bracelet fastener
Brakes
Bristles
Brushes
Brush case
Buckles

Buttons
Buttonholes
Butterflies

**Canes**
Capsules
Cards
Cartridges, waterproofed
Catamenial shields
Catheter
Cement
Chalcedony
Champleve enamel
Cheek plumper
Chess
Cigar holders
Cinematoscopic pictures
Cliches
Clock case
Coated hooks
Coiffure ornaments
Collars
Collar support
Collar tab
Color screen
Comb
Comb, massage
Coral
Corset fastener
Covered cranks
Cricket balls
Crutch top
Cuffs
Cupping apparatus
Cycle handle grips

**Dental uses**
Diffraction gratings
Discus
Discharge collecting vessel
Dish
Dish covers
Display advertising
Doll
Doll arms
Doll eyes
Doll heads
Dominoes
Drawing slates
Dress shields
Dress stiffeners

**Ear drum**
Ear expander
Ear screen
Ear trumpet
Electric cells
Embossing
Embossing photographs
Emery wheels
Eye bath
Eyelets
Eyes
Eye shade

**Fabrics**
Face protectors
Fans
Fashion busks
Feathers
Films
Film supports
Fishing line
Flexible needle
Flowers, artificial
Focussing screens
Foot arch supports
Fork handles
Frame tubes
Frames
Funnels

**Games**
Gem inlaying
Glove eyelets
Glove fastener
Go-carts
Golf ball
Golf ball cleaners
Golf club
Gutters

**Hair pin**
Handkerchief
Handles
Handle bars
Hat stiffener
Hats stiffened
Hat sweat bands
Hearing appliances
Heels
Helmet
Hockey balls
Hockey sticks
Hollow rings
Hollow balls
Horse shoe

**Imitating tortoise shell**
Imitating cloisonne
Imitating meerschaum
Imitating marble
Imitating red coral
Imitation jewelry
Impregnating paper
Incendiary shell
Incrusting metals
Inhaler
Inhaling apparatus
Initials
Insoles
Instrument handles
Instrument keys
Insulating
Intaglio plate
Intaglio design

**Jar cover**
Jet imitating
Jewel slide
Jewelry
Jewelry clasp

**Kaleidoscope**
Knife handles

**Labels**
Label, transparent on mattrass
Lace stiffener
Lacing fastenings
Lacing strips
Lacing tips
Lacrosse balls
Levers
Light filters
Lining hollow articles
Lithographic stone
Lithotransfers
Lorgnette holder
Lubricant

**Magic lantern slides**
Manicure instrument
Martingale rings
Massage comb
Massage appliances
Measures
Measuring cups
Medallions
Meloharp picks
Memorandum tablet
Mirror back
Mosaic
Moulding gear cases
Mounting billiard cue tips
Mud guards
Music clips
Musical instruments

**Nail brush**
Nail polisher
Necklace
Necklace fastening
Necklace adjusters
Necktie retainers
Negatives

**Onyx imitating**
Open seam coverings
Ophthalmological uses
Orthopedic uses
Otological uses

**Pads**
Paint remover
Paper cartridges
Parasol tips
Parlor tennis balls
Pens
Penholders
Pessary
Phonograph boxes
Phonograph
Phonograph horns
Phonograph records
Phonograph reproducing needles
Phonograph resonators
Phonograph sound boxes
Photo diaphrams
Photomechanical uses
Photophonograms
Photo-reliefs
Photo screens
Piano keys
Pigments
Ping pong balls
Pipe tips
Plate lifters
Playing cards
Plasters
Plastic embossing
Plectrums
Plumes
Pocket book
Pocket clip
Pocket lighters
Polychrome screens
Portfolio
Poultry rings
Powder puff
Primers
Printing blocks
Printing paper
Pulmonary appliances
Pump clips
Pus cups
Puzzles

**Quills**
Quoits

**Razor blade**
Razor handle
Records, transparent phonograph
Rectal appliances
Reinforcing wearing apparel
Reliefs
Reproduction technic using
Reservoir
Respirator
Ribbe accumulator
Ring protector
Ring stoppers
Rings
Rods

**Scalpettes**
Screen plates
Screens, focusing
Screens, polychrome
Sensitized films
Sheets

(*Concluded on page 416*)

# Manufacture and Uses of Wood Flour

## This product, made from waste wood, has become one of the most important fillers in modern plastics

*By Harry H. Steidle*

*Research Assistant, National Committee on Wood Utilization*
*U. S. Department of Commerce*

APPROXIMATELY twelve million pounds of wood flour is imported annually from Europe into the United States.

This is made from nothing more than sawdust, shavings and other mill waste which in this country is generally regarded as a liability and a fire hazzard. While American operators are spending money to dispose of this class of material, European lumber manufacturers are converting it into wood flour, exporting it to this country, paying duty and evidently selling it at a profit.

European woodflour is claimed to have certain advantages over the domestic product, but the validity of the claim is questionable, and increased experience and care in the selection of American manufacturers shold result in a product in every way equal to that produced by foreign mills.

*Examples of molded objects made from wood flour. The binder in this instance was ordinary starch paste. The products are structurally strong and of pleasing color and appearance. It will pay every producer to experiment along these lines.*

### The Domestic Product

Wood flour has been known and produced in this country for some time, but the production was limited to a very few companies, and little attention has been given it as a phase in the utilization of sawdust, shavings and other milling waste until recently sponsored by the National Committee on Wood Utilization.

The uses of wood flour are numerous and diversified, ranging all the way from dolls to dynamite. New uses are constantly being developed and it promises to become an important industrial product as well as a profitable economic solution for the disposal of material that has heretofore been frowned upon.

The wood substance of various species of trees differs very little in composition. The wood substance of hickory is not unlike that of poplar, the chief difference in the two species being in the physical structure of the material. However, there are certain infiltrations of gums and resins in some woods, and in other certain colorings that precludes their use as wood flour for some products. Spruce, fir, and pine are the chief woods used in Europe to produce the highest grades of wood flour. Similar species are represented by our true firs, white pines and spruces. Little investigation has been undertaken regarding the suitability of American species for the manufacture of wood flour, but from casual observations the wood of maple, ash, white birch, and basswood, in addition to the species now in use should be capable of producing a good grade of wood flour, since they are entirely devoid of resin and possess the necessary light color.

### Manufacturing Process Stone Mills

Wood flour, as the name implies, is a finely ground or pulverized form of wood. In Europe it is ground chiefly by stone mills, which are an adaptation of the old burr stone mills used for the grinding of wheat and other grains. They consist of two large mill stones, one of which is stationary while the other is connected to a vertical shaft and revolved.

The grinding stones are entirely enclosed in a wooden or steel structure, except for an intake at the top. The upper grinding stone has a sizable opening in the center through which the chipped trimmings and sawdust are conducted by means of the intake feed pipe. This material is deposited on the lower stone, which is flat. The stones grind firmly against each other, except at the inside, where the grinding surface of the upper stone is somewhat concave, forming a space for the

coarser wood material when it first enters between the grinding stones. The material is thus gradually reduced and finally deposited as flour in the encasing at the periphery of the stones. Here it is drawn or blown off, and after screening is put into sacks. Steam or water in limited quantities is introduced into the mill to prevent excessive heating from friction.

### Steel Burr Mill

Another type of mill, used chiefly for the conversion of sawdust into wood flour, is the steel burr roller mill. This consists of a series of corrugated steel rollers, each succeeding roller having teeth of increasing fineness. The rollers are closely set and revolve in opposite directions at different rates of speed. The sawdust is passed through the series of rollers and ground to the required degree of fineness.

### Pulverizing Machine

Among other patented devices of American manufacture is a wood pulverizer for the conversion of shavings, sawdust, and hogged wood into wood flour. The material is fed through a hopper into a grinding chamber in which a high-speed grinding wheel operates. The material is pulverized by action of the grinding wheel against the sides of the chamber, which is likewise lined with a grinding surface.

One of the features of this machine is the absence of screening apparatus. A current of air is used to draw the material from the grinder. In the upper portion of the machine this current of air is allowed to expand into a somewhat larger chamber. Here the air on expanding loses part of its lifting power and the coarser particles which were held in suspension fall back into the grinding chamber. The dust-laden air is conducted on to a large settling chamber where the wood flour is finally precipitated to the floor. In this manner, the fineness of the flour is closely regulated, the slower the air current, the finer the product drawn off.

### Uses of Wood Flour

There are many different products into which wood flour enters as an important constituent. Chief among them are the following:

**Linoleum** — Approximately 20,000,000 pounds of wood flour is used annually in the linoleum industry. It is employed chiefly in the manufacture of inlaid types, although it is also used in smaller proportions mixed with cork flour, in the production of the "battleship" and printed linoleums.

The light fluffy nature and consequent space-filling properties of wood flour make it particularly desirable as the filling constituent in linoleum. It is intimately mixed with cementing materials consisting chiefly of resin, linseed oil and Kauri gum. The resultant mass is of a tough, dougy consistency. This is rolled into layers cut into the desired figures, and cemented to a burlap backing under intense pressure and heat.

Because of the necessity of imparting different colors to the various figures of inlaid linoleum, it is essential that the filler be light in color and capable of taking pigments. Wood flour possesses these characteristics which adds materially to its importance as one of the chief constituents in the manufacture of inlaid linoleum.

Both imported and domestic wood flour are used by the manufacturers of linoleum. The imported product is somewhat finer than the domestic, but is less uniform in its properties, and, contrary to general opinion, is not as light in color as the best grades of domestic manufacture. The extremely fine European woodflours produce a linoleum that is susceptible to a higher surface polish, although the fluffy, slightly fibrous nature of the domestic wood flour off-

(*Continued on page 404*)

# And still more buttons!

THE latest fashions decreed from that arbiter of the modern mode, Paris, insist upon the use of large amounts of buttons.

As the demand increases, the sales take a corresponding jump upwards. Due to the striking color schemes which are possible with the casein and pyroxylin buttons many beautiful effects can be attained.

The tendency appears to be to have the edging strip and buttons in contrasting colors to the fabric.

Button molders and fashioners will be pleased at this style.

Patou and Landin, leading designers of feminine apparel, are stressing the vogue for buttons in their latest models. Patou recently designed a gown in which four rows of buttons running the length of the garment was the predominating feature.

# "Karbolite"--A New Phenol Resin

## Russian chemists develop use of "naphtha-sulfonic acids" as catalysts and ingredients in the rapidly hardening type of condensation product

*By G. S. Petroff*

(A communication from the Karpoff Institute of Chemistry at Moscow, Russia. From *Kunststoffe*, 1926, **16**, 81, 107, 124)

DURING the early years of the Great War, in 1914, a phenol resin was developed in Russia, under the name of *Karbolite*, and details regarding its properties are now being published for the first time.

According to the author, a very important point in determining the quality of an insulating material, is its freedom from moisture, as even small amounts of this will seriously interfere with the insulating properties, especially where fairly high voltage are encountered.

Karbolite is a condensation product of phenols, aldehyde and naphthasulfonic acids. Its manufacture as well as properties sharply differentiate it from the better-known phenol resins such as Bakelite and the like. In order to throw some light upon the nature of this new condensation product, a sample batch of the material was made up from the following materials:

1. Technical carbolic acid, containing 87% of phenolic bodies.

2. "Naphthasulfonic acids" (*not* naphthalene sulfonic acids, but substances produced from mineral oils according to a process patented by G. S. Petroff, German patent 267785), containing about 50% of the sulfonic acid in question.

3. Commercial formaldehyde, which was used in two different portions, containing 34.05% and 40% of formaldehyde respectively.

The amounts of the above material used were: 100 parts of phenol, 30 parts naphthasulfonic acid and 32 parts of formaldehyde, the latter colculated as absolute $CH_2O$. The process of preparing the resin was carried out in two distinct steps. In the first step, 100 parts of phenol, 30 parts of naphthasulfonic acid and 38 parts of 34.05% formaldehyde solution were heated together until the water separated. The initial condensation product, which was then in the resinous form, was separated from the water formed.

The second step consisted in adding the balance of the formaldehyde required, pouring the mixture into molds and hardening by heating 95 to 100°C. It was not found necessary to dry the resin in a so-caled "Bakelizer." The Karbolite made in this manner was tested and found to have the following

TABLE 1

| Reaction products of phenol and formaldehyde | Quantities obtanied in gms. | Acid number in mg. of KOH, using methyl orange | Acid number in mg. of KOH using phenolphthalein | Difference between the two titrations | Content in naphthasulfonic acid calc. as $C_{20}H_{27}SO_3H$ | Amount of naphtha sulfonic acid in gms. |
|---|---|---|---|---|---|---|
| 1. Resin | 146.81 | 9.2 | 13.8 | 4.6 | 4.95 | 7.26 |
| 2. Aqueous layer | 12.58 | 20.42 | 27.54 | 7.12 | 10.95 | 1.31 |
| 3. Oily layer | 6.41 | traces | — | — | — | — |

*Composition of the preliminary condensation products.*

TABLE 2

| Pulverized Karbolite | No. 1 | No. 2 | No. 3 | No. 4 |
|---|---|---|---|---|
| 1. Water content | 12.86% | 12.81% | 14.07% | 16.16% |
| 2. Water and other volatile matter at 100°C. | 14.71% | 15.54% | 15.94% | 14.10% |
| 3. Specific gravity | 1.161 | 1.158 | 1.143 | 1.144 |
| 4. Alcohol-insoluble | 75.30% | 69.05% | 69.05% | 65.08% |
| 5. Insoluble in alcohol-benzine mixture | 72.21% | 71.88% | 65.64% | 66.67% |
| 6. Alcohol insoluble as determined on a piece of the Karbolite | 95.69% | 92.80% | 93.28% | 89.96% |
| 7. The amount insoluble in alcohol-benzene on a piece of Karbolite | 83.56% | 89.70% | 92.76% | 95.39% |
| 8. Ash content | 0.65% | 0.78% | 0.49% | — |

dielectric mechanical and physical properties.

Resistance to electrical puncture:

7,000 to 10,000 volts for 1 millimeter thickness.

14,000 to 20,000 volts for 2 millimeters thickness.

22,000 to 35,000 volts for 4 millimeters thickness.

Specific resistance 1200 megohms centimeters.

Dielectric constant 5-6.

Did not ignite by voltage discharges.

Specific gravity 1.147 to 1.160.

Maximum bending strength 310 to 1420 kilograms per square centimeter.

Modulus of elasticity E= 22,630/30,200 kilograms per centimeter.

Maximum compression strength 840 to 1150 kilograms per square centimeter.

Elongation before rupture amounted to up to 1%.

There was no permanent deformation due to bending, etc.

The coefficient of linear expansion as measured in a Lavoisier and Laplace apparatus amounted to 0.0000118 from 20 to 750°C.

The product was then analyzed with the following results:

*Water.* A piece of the Karbolite was finely pulverized and dried at 100°C to constant weight. The results varied from 14.75 to 16.41% of loss in weight, or moisture. In another test the powdered resin was dried to constant weight in a dessicator over sulfuric acid, the moisture found by this process being from 12.86 to 16.16%.

TABLE 3

**Action of an Alcohol-Benzene Mixture upon samples of Karbolites No. 1, 2, 3 and 4, in powdered conditions. 5 hrs.**

| | No. 1 | No. 2 | No. 3 | No. 4 |
|---|---|---|---|---|
| Amount of soluble extract | 19.77% | 14.49% | 14.05% | 15.99% |
| Acid number of the extract (methyl orange) | 13.6 | 17.82 | 16.36 | 25.42 |
| Acid number of the extract (phenol phthalein) | 40.82 | 53.46 | 27.82 | 71.18 |
| Total acid number | 54.42 | 71.28 | 44.18 | 96.60 |
| Quantity of sulfonic acids found on basis of $C_{20}H_{27}SO_3H$ | 6.80 | 8.91 | 8.18 | 12.71 |
| Amount of sulfonic acids in the Karbolite, calculated from the extract | 1.34 | 1.29 | 1.15 | 2.03 |

TABLE 4

**Action of Ethyl Alcohol alone on the above samples.**

| | N. 1 | No. 2 | No. 3 | No. 4 |
|---|---|---|---|---|
| Amount of soluble extract | 19.21 | 18.10 | 14.84 | 15.02 |
| Acid number of the extract (methyl orange) | 57.14 | 9.68 | 11.34 | 17.14 |
| Acid number of the extrict (phenol phthalein) | 51.42 | 67.74 | 84.90 | 77.14 |
| Total acid number | 108.56 | 77.42 | 96.24 | 94.28 |
| Quantity of sulfonic acid as above | 28.57 | 4.84 | 5.67 | 8.57 |
| Amount of sulfonic acid in Karbolite | 5.49 | 0.88 | 0.84 | 1.29 |

TABLE 5

**Extration of non-pulverized Karbolites with a benzene-alcohol mixture.**

| | No. 1 | No. 2 | No. 3 | No. 4 |
|---|---|---|---|---|
| Amount of soluble extract | 8.33% | 2.59% | 1.31% | 0.81% |
| Acid number of the extract (methyl orange) | 20.40 | 16.66 | —— | —— |
| Acid number of the evtract (phenol phthalein) | 54.44 | 33.34 | 88.88 | 14.80 |
| Total acid number | 65.84 | 50.00 | 88.88 | 14.80 |
| Quantity of sulfonic acids found on basis of $C_{20}H_{27}SO_3H$ | 10.20 | 8.33 | not present | |
| Amount of sulfonic acids in the Karbolite, calculated from the extract | 0.85 | 0.24 | not present | |

*Soluble constituents.* Air dried Karbolite was extracted in a Soxleth apparatus with various solvents, such as 95% alcohol, benzene, and a 1:1 alcohol-benzene mixture. A 5-hour extraction with benzene yielded 8.11% of benzene soluble extract. 5 hour extraction with alcohol yielded 15.39%. A similar period of extraction with the benzene-alcohol mixture yielded 15.06% soluble.

To determine the nature of the action exerted by the particular "naphtha-sulfonic" acids used in this condensation product, several further experiments were carried out. This yielded a condensation product of the soluble type (first condensation stage). The material used for producing this product were:

(1) 100 parts of English carbolic acid containing 87% of a mixture of ortho-, meta and para-phenols, a small amount of other oxygen compounds, and 13% of neutral hydrocarbons, mostly oils and naphthhalene.

(2) 35 parts of a "naphtha-sulfonic" acid, containing 45.8% of the pure sulfonic acid, based on the formula $C_{20}H_{27}SO_3H$, and 22% of mineral oil; the balance consisting of water alcohol and impurities such as 0.8% of sulfuric acid, which however, was first neutralized with sodium hydroxide before using the sulfonic acid.

(3) 35 parts of formaldehyde solution, containing 31.5% $CH_2O$. The mixture of these three substances was heated in an open copper vessel whereupon a very energetic reaction took place, liberating consider-

(*Continued on page 406*)

# Percussion Press for Preforming Bakelite

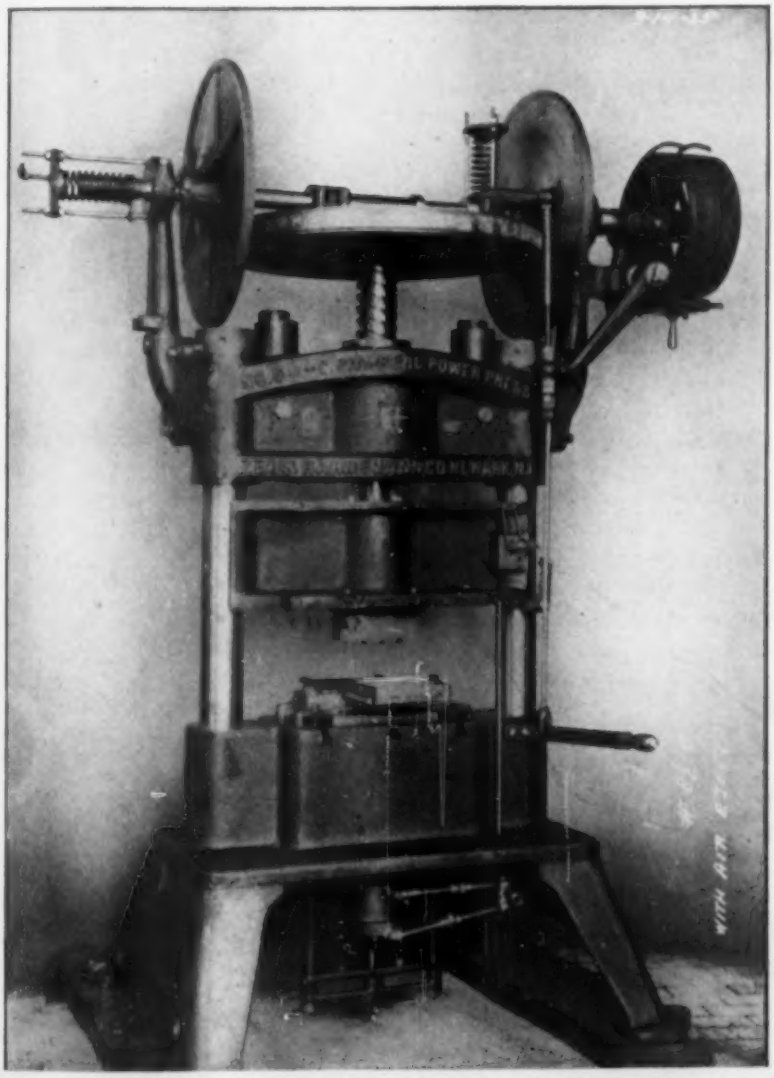
## Offers many advantages where large tablets are required for moulding operations

*By Leon V. Quigley*

THIS article deals with a special type of press which although designed for metal stamping, and tile forming, has proved especially adaptable to the performing of Bakelite molding materials. This unit, known as the Z. & H. Patent Percussion Press, is used to form Bakelite molding powder into cakes or tablets which can then conveniently be placed in the dies of hydraulic presses for molding under heat and pressure.

### Measuring the Charge

In the molding of phenol resinoid plastics, it is desirable that the right amount of molding material be apportioned to the die—in other words, that the charge be uniformly correct by weight. There are three ways by which this is accomplished: (1) weighing individual charges by hand; (2) measuring the powder into individual charges, by machines; (3) preforming the powder into biscuits or pellets, by machine. The hand weighing method is impracticable for mass production because accuracy is obtained only at a sacrifice of speed. The second method, automatic measurement of the powder, is successfully applied by some of the measuring machines now on the market. Here the operator merely places empty containers on a conveyor and removes those which have been filled. About fifty charges per minute can be measured, with a variation of not more than 1%. This method is extensively used, especially in complicated jobs where the necessity of incorporating a number of metal inserts in the molded part, makes the use of a preformed tablet impractical. In the majority of cases the third method — that of preforming the molding material into rough blanks by cold pressing—has been adopted in the interest of convenience, speed, and accuracy. By this system the powder is pressed together in cakes which are usually discs, or of a shape roughly approximating that of the finished object. These are conveniently placed in the die cavities for molding, and when occasion demands, two more discs can be used, placed one on top of the other to provide a larger charge. It should be remembered that the preforming operation does not in any way encroach on the principal molding operation. It is a physical process, merely—



*The Percussion Preforming Press is massive in construction and its principle of operation differs from that of other preforming machines.*

the dry powder is formed into a tablet by the use of high pressure but no heat. The tablets are firm enough to withstand such handling as they are subjected to before use.

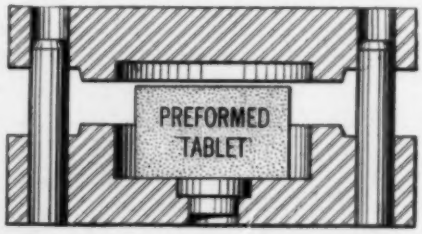
### Advantages of Preforming

The use of *preforms* provides a clean, expeditious, and accurate way of handling the molding charge, because it eliminates the necessity of loading the mold with fine powder. Another advantage is that the preforming operation expels a large portion of entrained air from the molding material, decreasing the compression factor in the subsequent molding operation by about 40%. It also makes possible the use of overflow molds in cases where otherwise they would be impractical. A glance at the accompanying illustration will show how a preformed biscuit can be used in a typical overflow mold because by preforming, it is possible to compress a sufficient charge of Bakelite molding material into compact space. The same weight of material poured into a loose pile would in many cases be quite unmanageable in this type of mold. It is of course obvious that the use of preformed tablets is not entirely limited to the overflow type of mold and can also be applied advantageously to certain types of positive molds.

The typical preform cake is about two-thirds of the diameter of the molding cavity, and may rise considerably above the cut-off flash ridge. Another advantage claimed for preforms is that they make possible the obtaining of better grain when molded pieces having mottled or wood effects are to be produced. The elongation which comes during the compressing and fluxing of preform cakes results in a kind of streaking of the vari-colored particles into a lengthwise arrangement of grain, whereas otherwise — as occasionally when powder is used—there results a spoting which is artificial, and unpleasing.

### Preforming Machines

When the need for preforming Bakelite molding powders into tablets arose, it was perhaps natural to rely upon pharmaceutical machinery to do the work. Medicinal tablets had long been popular, and a number of highly satisfactory tabletting machines had been developed for their production. These machines found a new field of service in the preforming of Bakelite, and are used at the present time in plastic molding plants. There are of course many instances where the Bakelite tablet is not very large and the conditions of operation are as favorable to the tabletting machines as if they were making medicinal pellets. With the increasing development of Bakelite molding and its continual expansion into new fields, larger and larger tablets have been required, and the need of more powerful machinery for preforming has been recognized.




*Preforms are used in the overflow type of mold where a charge of loose powder would often be impractical.*

### Percussion Press Built for Hard Service

For some time prior to its entrance into the field of Bakelite molding, the presses designated as of patent percussion type had been proving their value in the manufacture of tiles. Wall tiles 3″x6″ were being formed three at a time, and fifty or more of the small hexagonal floor tiles were being shaped by a single stroke. The service was reasonably strenuous, but the presses were giving no trouble from breaking. Subsequently it will be shown how their principle of construction which is essentially different from that of other preforming machinery, makes them free from the danger of breaking under accidental underload. With their successful use in the tile industry as an incentive, percussion presses were tried out on Bakelite molding and gave very convincing results.

### Description of Press

The typical Z. & H. press used for preforming Bakelite molding powders is of massive steel construction. A broad base houses the ejecting mechanism, consisting of an air cylinder which is so connected as to provide for raising and lowering the die housing, or chase, which is cushioned against vertical springs firmly set in the base. The upper casting which contains the main screw bearing, is supported by two heavy steel pillars which serve as guide ways for the heavy punch as it moves up and down. Supported by the upper structure is the main horizontal punch disc, centrally mounted; also the driving mechanism consisting of horizontal shaft, vertical drive discs, driving pulleys, etc. The drive shaft is mounted on solid shoulder brackets bolted to left and right of the upper casting of the press.

The loading device consists of a square metal frame about 2″ high, with an arrangement of small rods about 1½″ apart assembled in the bottom. This is drawn back and forth by hand in the process of loading the die. Since this frame is bottomless, and has close contact with the bed on which it slides it is able to fill the cavity with powder on the advance motion, and level off the charge when it is retracted.

The hand lever at the right, which is the principal control device, governs the movement of the punch. The foot-lever at the bottom, right, actuates the air

(*Continued from page 408*)

# Origin and Rise of the Casein Solids

## The French claim to have originated this industry although its main development was in Germany

*By Marc Fontaine*

*From Revue Generale des matieres Plastiques 1926, 2, 92*

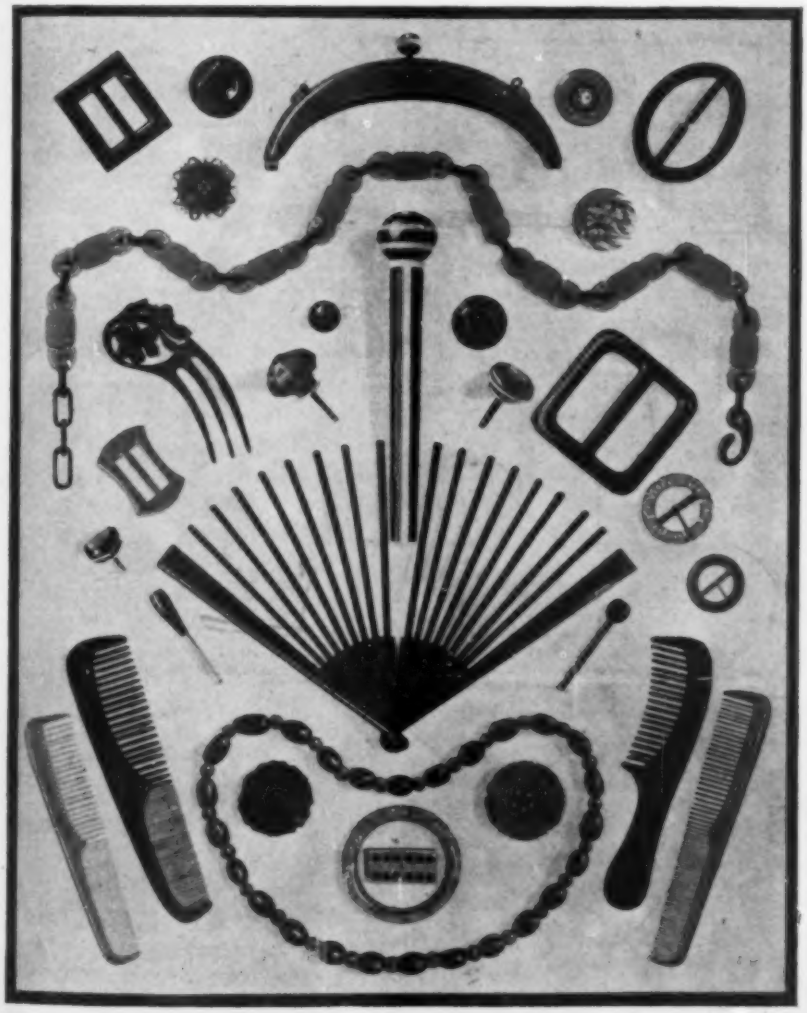
AMONG the modern plastic materials, the casein solids are taking an important place. It is our object in this series of articles to study not only the rise and development of this industry, but to discuss the various raw and intermediate products in some detail.

Most of the articles which have appeared in the diverse journals in the past have concerned themselves chiefly with the various patents taken out on the subject, without touching upon the manufacturing and economic problems involved.

### History and Economic Considerations.

As France is a large producer of the natural raw materials, it should naturally be in an excellent position to develop this industry on its own ground. It is a peculiar fact, however, that before the war but little was done in the field. Today, however, without fear of successful contradition, it is safe to say that the industry is in a highly flourishing condition.

The production of casein solids as a commercial plastic material is, other statements notwithstanding, a typical French invention. It is based upon the commercialization of one of the essential raw materials, namely formaldehyde. Trillat, in 1891, noticed that formaldehyde had the property of hardening albuminous substances, and of rendering the same insoluble. Shortly after the manufacturers of buttons, in France, began to adapt the process to the manufacture of small objects, using a mixture of casein, chalk, with or without alum or borax. However, the products did not meet with very much favor. The property of formaldehyde of hardening gelatin was made use of in 1893, and small translucent gelatin plates were manufactured, and used by dressmakers in the adornment of women's clothes. About the same time the firm of *Maison Hullard* began the production of casein objects at Suresnes, in France.



*This is the illustration of a four page advertisement issud by Lactolithe, a French casein solid, and which shows some of the applications of this product.*

### Galalith

Thus it will be seen that the very first formaldehyde-hardened casein as well as gelatin objects were first manufactured in France. But behold! "A prophet is not without honor except in his own country." The French industrialists did not

take the invention seriously, but considered it nothing more than an interesting laboratory novelty. It accordingly passed the frontier of France to find its first real commercial development in other lands.

This was particularly unfortunate, as France, being an agricultural country had every reason to develop an industry which employed a typical agricultural waste product—casein. It should be remembered that, after all, casein is an unavoidable waste product produced during the manufacture of butter. Casein is never extracted from full milk, but invariably is made from skim milk, so that a self-sustaining casein industry does in no way remove anything that is essential to the feeding of the population.

In 1894 the firm of Schering took out the German Patent 107637; followed in 1897 by German patent 127942 of Ernst W. Kirsche and Adolph Spitteler. A little later the Galalith Co. took out patents in Germany, thus making M. Trillat's idea practical. (German Patents 141309; 147994 and 241887; French Patents 292705, Sept. 21, 1899, and addition dated 1901; French Patent 322554 of June 27, 1902.)

Thus casein solids were developed, under the name of *Galalith* virtually in exile from their original home. The name Galalith was trade-marked by the Vereinigte Gummiwarenfabriken Harburg-Wien.

### France Starts Production

In 1904 the French firm working the Spitteler patent, at a plant founded by Pellerin and Orosdi, merged with the German concern to form the company now controlling the Galalith product, under the name of Internationale Galalith Gesellschaft Hoff & Cie. A branch plant was started at Levallois-Perret, later moved to Gennevilliers (Seine). This large plant took its supply of casein from a factory at Landrecies, in Northern France, operated by the same company, and there developed the caseins solids industry on a commercial basis.

At that time this was the only plant in the world producing the product. Almost immediately after the outbreak of the European War, the production of casein solids in Germany sharply diminished, and as the French plant at Gennevilliers was placed under sequestration, the French undertook to develop the industry on their efforts. As an example of this it is interesting to point out, that while the war was still raging in 1917, France exported 350 tons of hardened casein solids.

---

*This description of the origin and present economic condition of the casein solids industry presents the European and especailly the French side of the question.*

*The Germans also lay claim to the discovery and an article on this subject will appear in an early issue of* PLASTICS.

*As American producers are in active competition with imported goods, and as the casein solids are increasing rapidly in popularity, the foreign development is certain to be of interest to both producers and consumers.*

---

The tendency has grown of late to use the names Galalith or Gala for short as a sort of type name for all these products. This is to be deplored and was condemned by the French Syndicate of Casein Solids Monufacturers. It was finally decided to call the material by the name of *Caseine durcie*, which means *Hardened Caseins*. The modern American term favors the words *Casein Solids*. The older name, artificial horn, is not sufficiently precise to meet the requirements. Other names, such as "imitation this or that" are likewise objectionable. Hardened casein solids are sufficiently individual to carry their own name, without the addition of the term "imitation or substitute."

### The Well Known European and International Concerns.

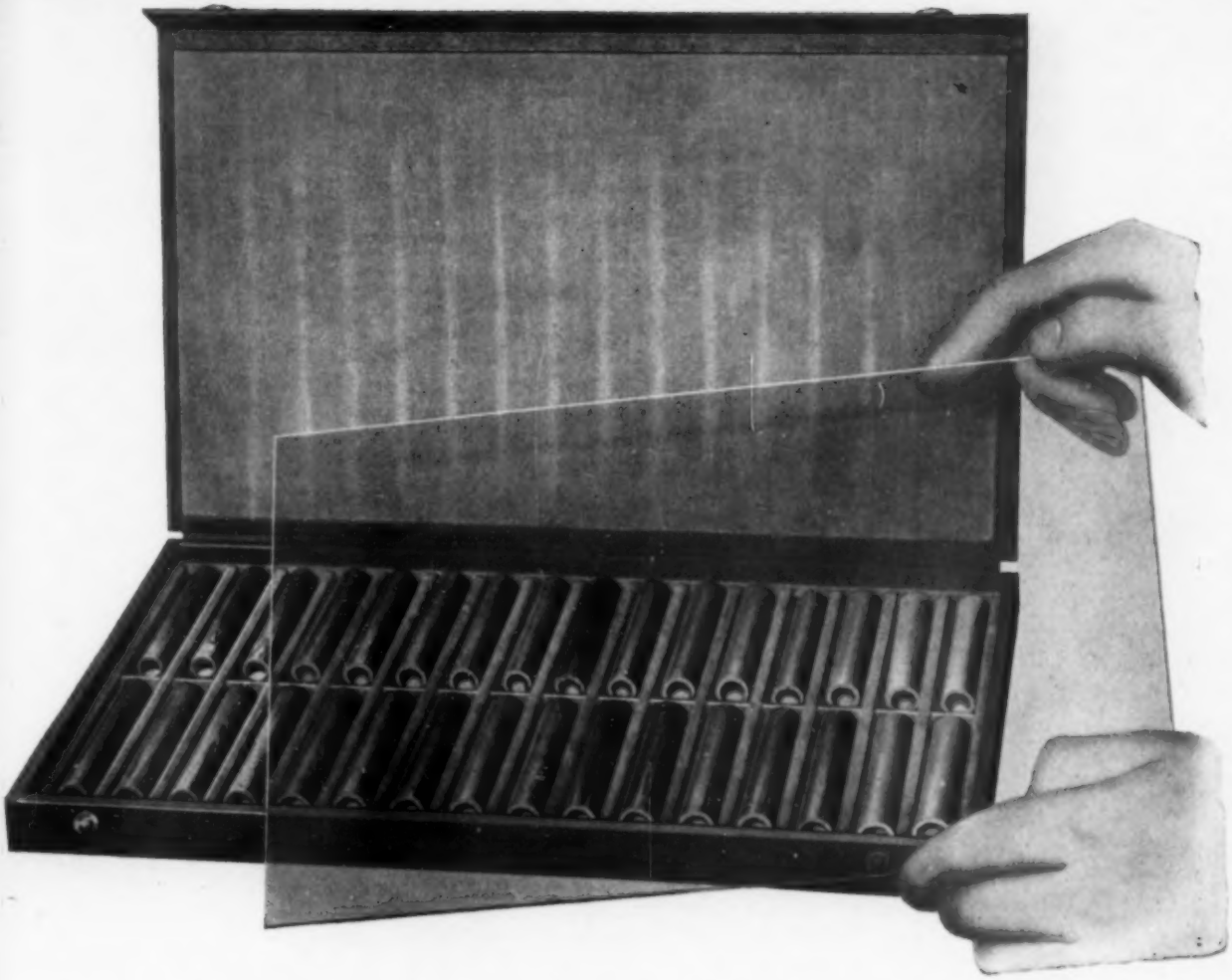
One of the larger French industrial companies, the Compagnie Generale d'Electricite, placed on the market, about 1917, a purely French casein solid under the Gallicized name of "*Lactolithe*," the product being manufactured at Vitry-sur-Seine. The various imitations of jade, or amber, "demi-blonde transparent," Irish horn and Brazilian horn found much favor among the purchasers. Various French "celluloid" or pyroxylin plastic manufacturers, recognizing the competitive value, and commercial possibilities of the casein solids, embarked upon their manufacture, thus making the French industry independent. For instance, the Societe Industrielle du Celluloid at Lilletaneuse near Paris, put the product on the market under a trade name consisting simply of their initials, "S. I. C." At the town of Oyonnax, the Societe Oyonnaxienne made a product termed *Oyogalithe*, manufacturing a number of different shades and effects in casein solids.

The firm known as the Societe Oyonnithe, located at Montville, near Rouen, France, put out a number of different products. Among the casein solids sold during the period following 1917 were *Isogalithe, Claudilithe, Casolithe and Orolithe*. Soon the French fabricators and artisans had no more reason to envy their confreres at Nuremburg in Germany, as a complete line of casein solids was now available for their use.

### Export Trade

During 1924 the export (from France) of the various Casein Solids exceeded 1000 tons, which is double that of the German before the war, and the imports were about 400 tons, most of this coming from England.

(*This will be continued in December*)



# *And now—transparent sheets and tubes*

Inda (non-inflammable)

The range of colors and combinations of colors in which Inda, the perfected casein solid, is available is practically without limit. Every hue of the rainbow may be had, and also the far more complete collection of bizarre tints that milady demands in her wardrobe of today.

But Inda is not limited to opaque effects—in sheer, distortionless transparency it is still beautiful. Notice, if you will, how readily you can see the fine details of Inda mottled tubes through an eighth inch thick sheet of transparent Inda.

Inda is readily cut, machined and polished. It is absolutely non-inflammable and has a very high dielectric strength. In transparent form it can now be furnished in sheets of varying thickness.

AMERICAN MACHINE & FOUNDRY COMPANY
5502-5524 Second Avenue, Brooklyn, N. Y.

# EDITORIAL · IMPRESSIONS

## *Plastic Materials Coming into Their Own*

MOST of the World's progress consists not so much in some startling new development, but rather in the sort of gradual growth that has, by some individuals at least, been compared to evolution. This is especially true in the field of manufacture, perhaps even more so than in other and more abstract lines of human endeavor.

As a general rule, when new articles or methods are offered by inventors and discoverers, they are really substitutes for something which has just preceded them. At first, when man made use of the materials he found all ready furnished him by a bountiful providence, his progress was marked mainly by mechanical refinements in the manner of fashioning them, rather than by any attempts to find a new use, or even a substitute for them. Thus ivory had been used for countless ages for ornaments and the more expensive utilitarian articles. The art of working and carving this semi-precious material was highly developed in the Orient long before our European ancestors had laid aside their ancient war-clubs and settled down in communities.

### Substitutes

Jade, that highly-prized mineral which is the subject of the collectors of Chinese antiques, and the intrinsically beautiful Japanese lacquer ware also originated in the Far East. It is only too obvious that we owe very much in the line of jewelry and art objects to the Orientals, who first developed sufficiently skilled and talented artisans to produce the coveted treasures of the collector.

Only as these natural materials became scarce did man attempt to find substitutes, or better still, to make them synthetically. In this field it has been the chemist, primarily, who has supplied the necessary inventive ability. Thus, out of the demand for an ivory substitute, evolved the pyroxylin plastic. The demand for a good button material, mainly, gave rise to the rapidly growing casein solid industry. Electricity, and the persistent search for a substitute for shellac, or, if possible, something even better, caused the development of the phenol resins. The demand for a flexible transparent glass substitute, gave us the pyroxylin film, and today even the lenses of our cameras can be made from synthetic plastic transparent materials such as the urea-formaldehyde materials, as Pollopas.

### New Fields

However,—and this is the important point from today's viewpoint—the latest line of development is not so much one of imitation of what already exists, but the finding of entirely new uses. Furthermore, plastic materials are now being applied to uses that the world surely had thought impossible but a few years ago. Materials which for countless ages have been used for specific purposes, are seeing themselves replaced by substances which they never believed would come into competition with them.

The most notable examples of this line of development are the substitution of the metals by molded plastics, accomplished in the past three or four years; and the use of synthetic resins in place of wood for furniture and similar purposes. Ever since homes have been equipped with electric switches, the wall plates, chandeliers and other fixtures have been made of metal. Endless ingenuity had to be exercised to properly insulate the wiring from these conducting materials until somebody got the brilliant idea to make these same chandeliers and switch plates directly out of non-conducting materials. And now we have beautifully colored switch plates made from any of the three leading types of plastics,—pyroxylin, casein and synthetic resins.

Surely this was a development.

But the start only has been made. It can be confidently asserted that in the near future thousands of objects will be made on a production scale by molding thermoplastic materials. They will replace metal, wood, stone, glass, and even our common fibers. In fact it has already been found possible to produce materials in every respect the equal of cloth and leather without the necessity of first making a fiber, spinning it and then weaving the thread.

### Co-operation

All this progress continually widens the field of PLASTICS, and it is this field that we are trying to serve. The success of our efforts is dependent not only upon our own endeavors, but is closely interwoven with the support we shall obtain from our readers and friends. What we need most is the cooperation of those who are working in the industries involved, and who have the vision to realize that the days of secrecy are as antiquated as the Spanish Inquisition.

In these days of International Competition it requires the com-

PLASTICS

bined and co-ordinated efforts of everyone in the industry for it to hold its own and to forge ahead. Articles of intrinsic merit, on manufacturing problems, as well as those resulting from successful research, are solicited. The type of subscriber and the circulation of PLASTICS will assure a wide and interested circle of readers; so send in your contributions with the assurance that they will find careful and unprejudiced consideration.

---

### What Next?

In our October issue, we reproduced two articles on some rather startling developments in the field of PLASTICS. One dealt with the use of various new synthetic resins in the art of photography, and the other with the electro-deposition of non-conducting substances, such as the cellulose esters and rubber.

Here are two fields which are being entered, and the future development of which it is difficult to visualize, for the directions taken by these new steps can not be foretold. Who knows but that the time is not far distant when we shall have an entirely synthetic non-combustible moving picture film? A few years ago (1924) the writer predicted just such a development, but it came sooner than anyone had expected.

---

### Synthetic Resins

Almost every month at least one new name is added to the already long list of trade names for the phenol resins. The public is sure to be confused by all these names and the sooner these manufacturers get together in a trade-organization the better it will be for the industry as a whole. What is also needed is some generic name which will inform the user that the product is of some particular type. Phenol resin is too long and technical. How about it?

## Production Methods in Molding

(*Continued from page 386*)

and the inserts dropped into place in the countersunk holes. The protector pins are then put in place and the cavities jammed full of the now plastic pieces of sheet stock to the exten that they are built up around the protector pins G. The operator can usually time his work so that the sheet stock is not allowed to become heated beyond a certain degree. If too much heat is applied to the material it becomes ruined and cannot be reclaimed. The operator, of course, works with heavy leather gloves because the dies are always too hot to be handled with the bare hands.

### Molding

There are two small holes 0.040 inch in diameter in the work, these being blind holes for the lead wires from the bobbin winding. For the sake of clarity, the two small pins or cores which produce the holes were not shown in the sectional views of the assembled dies, but they are carried in the force plate. As soon as all the inserts have been set in place and the die cavities built up with plastic material, the mold is closed by slipping the force plate over the aligning dowel-pins. The prepared mold is then placed in the press where it is subjected to the required 2000 pounds per square inch pressure for a period of about three minutes.

The hot die is then removed from the steam-heated hydraulic press and placed between the pressure plates of another press in which cold water is used in place of steam. This sufficiently lowers the temperature of the dies so that the hot plastic material, still under pressure, will become completely solidified and shrunk sufficiently to permit ready removal upon opening the dies. The hot dies are left in the cold press for a

few minutes, the length of time depending on the judgment of the operator and being regulated in accordance with the size of the work. When the dies are opened they are reversed in position, that is the force plate is at the bottom, so that the bars A are on the force plate instead of in the base plate channels in which they are contained when the die is prepared for molding. This arrangement makes it possible to draw the bars from the side.

(*This article will be concluded in the December number of* PLASTICS.)

## Forming Zyl Eyeglass Rims by Extrusion

Frank Fraser, assignor of U. S.P. 1,584,283, May 11, 1926 to the American Optical Co., describes an interesting process for the automatic production of pyroxylin plastic eyeglass rims.

The plastic material is put into a heated tightly closed container into which a plunger works with a tight fit. The entire container is then heated until the plastic is sufficiently soft to flow and then it is extruded by pressure applied to the plunger.

The opening in this stuffing box is C-shaped, and the material as it issues is allowed to wind itself up upon a spiral mandrel, which is also kept sufficiently warm to keep the material plastic. Eventually ring sections are cut from the material to serve for the manufacture of eye-glass rims. Due to the fact that the material is originally made in the curved condition it will make a more perfect rim than could be produced from material which was originally extruded straight.

**Parker Finds New Advertising Idea in December Plastics**

## Wood Flour

(*Continued from page 390*)

sets the above advantage in that the minute fibres have a tendency to become felted in the cementing substance and thereby increase the tenacity and toughness of the finished product.

Another claim made for European wood flour is that it contains less resin. This, however, is not true when compared to the best domestic grades. However, for use in the linoleum industry the constancy of the resin content rather than the amount is the most important feature.

Generally speaking, domestic wood flour is preferred by the linoleum industry by reason of its uniformly light color, fluffy, slightly fibrous nature, and unvarying quality. Furthermore, the users are in closer and more intimate contact with the producers and can purchase in the quantities desired and for delivery as needed.

### Explosives

In the manufacture of explosives, wood flour has its greatest usefulness as a constituent of dynamite. Nitroglycerine in its natural state is extremely sensitive to shock and dangerous to handle, and is, therefore, barred from transportation on common carriers. However, when diluted with carbon carriers such as wood flour, and oxygen carriers such as sodium and ammonium nitrate, this sensitiveness is greatly reduced. Such mixtures are known as dynamite. A standard 40 per cent "straight" dynamite contains

| Constituent | Per Cent |
|---|---|
| Nitroglycerin | 40 |
| Sodium Nitrate | 44 |
| Calcium Carbonate | 1 |
| Wood Pulp | 15 |

Kieselguhr, a fine siliceous earth, was the original absorbing medium used in the manufacture of dynamite, but this

has given way almost entirely to the use of active constituents, of which wood flour, in varying degrees of fineness, supplemented in some cases with wheat flour, corn meal, and sawdust, enter as the most important materials. These constituents have a dual role to fulfill. Beside the physical absorption of the liquid nitroglycerin, there are also important combustibles and are known as active carbonaceous "dopes".

Since the force of an explosion is dependent on the sudden generation of a large volume of highly heated gases, the effectiveness of the explosive is enhanced by the use of active "dopes". Such inert materials as sand of kieselguhr do not enter into the reaction, while the active carbonaceous "dopes," such as wood flour, furnish in part the carbon and hydrogen to react with the excess oxygen of the nitroglycerin, thus approaching a complete reaction.

Miners, quarrymen, and other users have learned to associate light color with fresh, high quality dynamite, and for that reason the wood flour entering into the manufacture thereof must be light in color. The situation is unfortunate, because many species of slightly colored woods could be made into equally good wood flour. The demand for light colored dynamite is another example of custom and predjudice overruling facts.

### Bakelite

Among the newer industries demanding wood flour as a raw material is the manufacture of Bakelite. In its purest form, the substance is familiar as material from which pipe bits and sparkling amber-like beads are made.

Dr. Baekeland, the chemist who discovered the formula for producing this synthetic resin, knew that the commercial success of the substance depended on its introduction into industrial uses. However, he found the material excessively brit-

tle, which was a drawback in moulding it. He set about to find a filler that would reduce the brittleness and make it more resistant to shock. After long experiments with many kinds of pulverized and fibrous fillers, he finally settled upon the use of wood flour.

Bakelite is sold under several different trade names and the list of its possible uses is too long to include here. However, some of the more common applications of the moulded products are seen in radio dials, cementing material around incandescent electric bulbs, and in automobile ignition blocks, radiator caps, lever balls, etc.

### Other Uses of Wood Flour

In the making of "oatmeal" wall papers, wood flour is used as a surfacing. Colored wood flour is likewise used in the manufacture of velvet wall papers. The colored material is sifted onto the paper, to which an adhesive is first applied.

Chief among the other uses of wood flour is its application as a filler in the manufacture of composite materials which vary widely in their consistency and properties. The binding materials used to unite the compound are wide in range and varying in proportion. The more important application of these synthetic compounds includes their manufacture into unbreakable dolls, brush backs, candlesticks checkers, bowling balls, toys, graphophone records, and countless other objects.

The manifold uses of this increasingly important product should enlist the attention of every wood using plant where sawdust or other wood substance is being discarded. Under present conditions the greatest demand is for wood flour of light color, but with its growing importance as a filler in moulded articles, color will become of lesser importance.

Various types of grinding machines are being perfected for the manufacture of wood flour and there seems to be no valid reason for American manufacturers to discard their sawdust, trimmings, etc., while their European competitors are selling such material in the form of wood flour here in the United States.

## Karbolite

(*Continued from page 392*)

able heat. On cooling and settling the mixture separated into three layers, the lower one consisting of the initial condensation product, or Karbolit, the middle one consisting of water, alcohol, formaldehyde and sulfonic acids, and an upper layer of mineral oil. These different

TABLE 6

**Extraction of non-pulverized Karbolite with 95% ethyl alcohol.**

| Karbolite powdered | No. 1 | No. 2 | No. 3 | No. 4 |
|---|---|---|---|---|
| Amount of solvent extract | 1.44 | 1.07 | 1.01 | 0.64 |
| Acid member of extract (methyl orange) | —— | —— | —— | —— |
| Acid member of extract (phenol phthalein) | 28.78 | 70.60 | 126.32 | 108.0 |
| Amount of sulfonic acids | none present | | | |

TABLE 7

| Karbolite powdered | No. 1 | No. 2 | No. 3 | No. 4 |
|---|---|---|---|---|
| Extraction with alcohol-benzene | 1.34% | 1.29% | 1.15% | 2.03% |
| Extraction with alcohol | 5.49 | 0.88 | 0.84 | 1.29 |
| Extraction with hot water | 1.73 | 3.51 | —— | —— |

layers were analyzed, with the following results:

From these analyses it is quite evident that by far the greater portion of the sulfonic acids actually enters into the constitution of the resin. In fact, upon adding further amounts of formaldehyde, the balance of the sulfonic acids goes into the resinous portion.

The quantity of sulfonic acids in the infusible and insoluble Karbolite was also determined. Four cylinders of the anhydrous resin 15 millimeters in diameter, and obtained from 108 parts of the resin were used. These had an acid value of 17.7 (using phenolphthalein) or 11.8 (using methyl orange) and contained 6.87 grams of sulfonic acids based on the formula $C_{20}H_{27}SO_3H$. In order to convert this material into the infusible and insoluble form the following amounts of 40% formaldehyde solution were used:

1. Received in addition of 25% of the said formaldehyde solution; 2, 27.2%; 3, 29.4% and 4 31.4%. The resin was mixed with the formaldehyde by gradual heating in copper forms. When the temperature reached 100°C the process was complete. The four different types of Karbolite thus obtained, which are designated by numbers 1 to 4 in the table, had the following properties:

The percentage of sulfonic acid in the products was determined by extraction with a mixture of equal parts of alcohol and benzene.

(To be continued)

## Percussion Preforming Press

(*Continued from page 394*)

cylinder which is used to draw down the die chase in the ejecting operation. In the press illustrated will be seen the tripping arrangement mounted at the right of the punch frame, and designed to trip automatically the air cylinder control, releasing the die chase so that it may rise into position, to be reloaded as the punch descends.

The most striking feature of the press is the arrangement of discs at the top. The two vertical discs are driven constantly in the same direction. They alternately engage the horizontal disc which actuates the vertical screw, dropping or raising the punch. The driving discs present smooth surfaces of contact, while the driven disc offers a good grip by means of a leather friction belt tightly attached to its periphery. When the hand lever is brought down, the right disc engages; when the lever is released the left disc is brought into contact—the driven disc being successively lowered and raised by these operations. It will be observed that there are spring mountings at the top which permit the active contact of only one vertical disc at a time.

### Operation of the Press

In the cycle of operation the operator first bears down on the control lever, his action causing the screw to descend, delivering a kind of double percussion blow. The first impact is caused by the landing of the punch block, and immediately thereafter comes a second percussion as the screw plunger lands against the bed of this block. This double blow is a special feature, and it is claimed that it produces a better preform than does the simple stroke of other devices. The operator maintains pressure on the handle until the full effect of the blow has been delivered, and then re-

leases immediately, causing the punch to rise. The air cylinder is then operated either by pedal or trip, and the chase (die housing) is brought down, leaving the die bottom flush with the top of the housing so that the preformed cakes can be readily removed. Immediately, the operator then shoves his loading frame forward, pushing the finished cakes onto a belt conveyor, or into a hopper, behind the press. The die chase is then released, and rising into normal position makes the cavities again ready for a fresh charge from the loading frame which is then being drawn back over them. About the instant that the loading frame is fully over the cavity the operator pulls his hand lever, beginning the next cycle and starting the punch downward. Just as the punch begins to descend he withdraws the frame, and fills it with a new charge of Bakelite, delivered from a convenient shute, while the next batch of preforms is being pressed.

### Advantages

The leading advantage claimed for the percussion type of press is its ability to form tablets of large size and yet be in no danger of breaking when subjected to overload or variation in die charge. As has been realized by a number of plastic molders, other types of preforming machinery which are satisfactory for light work, are not infrequently broken when subjected to undue stress, overload of die charge, etc. Not only by its massive structure does the percussion press eliminate the possibility of breakage, but by its principle of operation. Instead of a positive unremitting action of definite, successive strokes, the percussion press by reason of its friction drive and screw thrust, offers a chance for recoil or slip-back in case of overload.

It is further claimed for the percussion press that instead of dealing a single, momentary,

(*Continued on page 413*)

# TECHNICAL ABSTRACTS
## AND PATENT REVIEW

**Utilizing the by-products of saccharine manufacture for production of plastic masses and syntheic resins.** Walter Herzog, Kunststoffe, 1926, 16, 105.

Points out the progress made during the years 1918 to 1925 in the utilization of certain waste products in the manufacture of saccharine (the artificial coal-tar sweetening material which is 700 times as sweet as sugar). The by-products in question consist of (1) para-toluenesulfochloride; (2) para-toluenesulfamide and (3) para-toluenesulfonic acid.

Discusses the patented processes of H. Bucherer (French patent 520,-319) who produces permanently light-colored phenol-aldehyde resins by condensing the ingredients in the presence of alkaline solutions of para-toluenesulfochloride. Also the British patents of M. Melamid (English 137,291 137,292, 137,293, 143,185 and 143,187) which depend upon the condensation of the non-resinous products obtained from phenol and aldehyde (such as ortho-oxybenzyl-alcohol) by means of para-toluenesulfochloride. These patents also cover the condensation of crude cresol, formaldehyde and paratoluenesulfochloride, the latter being the subject of Melamid's Swiss Patents 91,871, 93,282 and 93,283. The application of similar reactions by the same patentee to soft pitches and anthracene oils is touched upon, the latter processes being covered by Melamid's German patent 380,825 and Austrian 89,150.

Furthermore Melamid's has also taken out patents (Swiss 91,567; Norwegian 32,166) for the treatment of natural resins with the para-toluenesulfochloride, producing soluble resins of good quality. The corresponding German patent (346,699) includes condensation products of the salts of humic acid as well as "Lignoceric" acid, the latter being a substance obtained from bituminous coal and peat.

The discussion also extends to para-toluenesulfoethylamide and production of resins from it as well as the making of balsam-like resins and plasticizers for the cellulose esters.

**The Nitration of Cellulose.** R. Gabillon. Revue generale des Matieres Plastiques, 1926, 2, 495-506.

This represents a thoroughly scientific piece of laboratory research upon the mechanism of the nitration of cellulose; a detailed study is made of the effect of variations in the composition of the nitrating bath; the variation in the nitrogen-content, viscosity and solubility of the product upon under different conditions. The article is supported by numerous tables and charts giving the percentage of nitrogen in the different types of cellulose nitrate, the yield as calculated to original cellulose, the solubility in various solvents such as ether-alcohol, cold and hot alcohol, etc. 57 Bibliographic notes are given. The article is to be continued.

**The Casein Solids Industry.** Marc Fontaine, Revue generale des matieres Plastiques, 1926, 2, 514-519. **Formaldehyde.**

This is a continuation of the series of articles on the commercial production of casein solids, the main part of which is appearing in extenso in PLASTICS. (See p. 395) This installment deals exclusively with the history and manufacture of the formalin or formaldehyde used in indurating the casein solids. An interesting account is given of its discovery, manufacture and properties. Methods for the analysis of commercial formalins, and the use of this substance as a disinfectant and as a constitutent in synthetic resins concludes the installment, further articles being promised for a later number.

**Problems in the Manufacture of Pyroxylin Plastics; Studies on Nitration of Cellulose.** Michel Reclus, Revue generale des matieres Plastiques, 1926, 2, 519-523 (also see p. 382.)

Consists in a laboratory and production study of the effects of variation in raw material (cellulose) upon the properties of the cellulose nirate obtained. The sources include: Cotton, paper, bisulfite paper pulp, soda-cellulose, (both bleached and unbleached), reed cellulose, bamboo cellulose and rice-straw cellulose. Details concerning the yield, nitrogen-content, solubility, viscosity, stability and mechanical properties of the films obtained are given in detail and in tabular form.

**PRODUCING HOMOGENEOUS MOLDABLE POWDERS FROM FIBROUS CEMENTS.** I. E. Lanhoffer and O. E. Lanhoffer, assignors to Simon J. Dannenberg, New York City. U. S. Patent 1,580,787; Apr. 13, 1926.

The object of the invention is to provide absolute homogeniety in cements etc., containing fibrous material. The process consists in removing from a wet mixture of disintegrated fibrous material and cement constituting a mortar all excess water by compressing the mixture so as to form a block or plate and in subjecting this block or plate to the action of an emery or other abrasive wheel revolving at high velocity so as to reduce the material to a moist powder. This powder is then molded, or again wetted if a plastic mortar is desired.

**Cellulose Nitrate Collodions and Pyroxylin Films.** A Breguet, Revue generale des matieres Plastiques, 1926, 2, 507-513.

This is a continuation of the article appearing in the May issue of the above French journal (see Plastics, Sept. 1926, 2, 323 and 324). The action of heat upon cellulose nitrate solutions has been carefully studied, and the effect of this is given in a number of tables. The viscosity is lowered very much, especially when the heating is continued for about thirty days. The effect of the presence of various plasticizers, such as camphor, acetanilid and a material known as "Celludol". The influence of castor oil was also investigated.

A further study comprised the stabilizing effects of various organic materials such as pyrocatchine, resorcinol, hydroquinone, quinone, diphanthine, methyl orange, fuchsine, and erythrosine, which rapidly modify the properties of collodions. Gallic acid, tannic acid, phthalic anhydride, phenolphthalein, aminoazobenzene, helienylamine, fluoresceine, eosine, and methyl violet do not appear to exert any marked action. On the other hand, malachite green and rhodamine hydrichloride exert a very powerful influence in reducing the viscosity of the acetone solutions of cellulose nirate. Tables showing this are reproduced.

The action of light upon cellulose nitrate solutions was the next point studied. The lowering of the viscosity of these solutions is especially marked with ultraviolet light. and is in direct proportion to the duration of the treatment. Further work is promised in a later issue.

**Crystalline Character of cellulose acetate.** E. Ott, Helvetica Chimica Acta, 1926, 9-B, 378.

Earlier studies of cellulose acetate by means of the X-ray spectograph led to the conclusions that the material was amorphous, but more recent work indicates that carefully prepared cellulose triacetate has at least a feebly marked crystalline structure.

**Blowing Pyroxylin Plastic Objects.** Leon Bouvier, Revue generale des matieres Plastiques, 1926, 2, 524-525.

A general description of the production of hollow pyroxylin plastic objects, by blowing. Describes the manufacture of telephone receivers from pyroxylin plastic tubing, and small hollow toys from sheets. The plastic material is softened by hot water and placed in molds attached to screw presses, while either hot water or steam is used as the means for applying pressure to the interior of the objects. Under the influence

of the combined heat and pressure and material "flows" and expands so as to fill the mold and to reproduce the exact details of the dies. A short cooling while still under pressure "sets" the objects, which can then be removed.

## RECENT BOOKS

**Die Perle und ihre künstliche Erzeugung. (The Pearl, and the Production of Artificial Pearls).**

By Otto W. Parkert. Published by the Archiv für Industrie und Gewerbe. Vol. 2, 1925. Publication office: Die Perle, Naunhof, near Leipzig, Germany. (In the German language.)

This is the first comprehensive work on the subject of both natural and artificial pearls, by an acknowledged expert in the field. The first part of the work deals with the natural pearls, the growing of "artificial" natural pearls, pearl fishing, and kindred matter. Then follows a description of the manufacture of imitation pearls from such natural materials as coral, amber, ivory, bone, horn and ivory nut. The second part of the book, and by far the larger and more important, deals with the manufacture of artificial pearls from glass, porcelain, wood, gelatin, pyroxylin plastics, metals and he like. The patents on the subject, as well as technical descriptions of manufacturing processes are discussed and, in some instances, illustrated. For the manufacturer engaged in, or about to engage in the manufacture of this product, the book should prove highly interesting and valuable.

**Casein. Its Preparation, Chemistry and Technical Uses.**

By E. L. Tague, Ph. D. 205 pp. $3.00. D. Van Nostrand Co., New York. 1926.

The author, who is associate professor of Chemistry at the Kansas State Agricultural College, has undertaken to give to those who are interested in the chemistry and utilization of Casein, as complete an account of the chemical, colloid-chemical and physical properties of this important proteid material as can be crowded into a little over 200 pages.

The book is about equally divided into the strictly chemical and theoretical treatment of the subject matter, and the practical manufacturing side. The first six chapters deal with the general properties and preparation of pure casein, the chemistry of casein, including a discussion of the somewhat variant terminology used in America and abroad; compounds of casein with the alkalies and alkaline-earths, compounds of casein with heavy metals; decomposition products of casein; and the preparation and properties of para-casein.

As casein exhibits characteristic colloid behavior, the treatment of the chemistry of the material and its compounds has been from the colloid standpoint. This part of the work will be of great interest, and of much utility, to the chemists and technolo-

gists who are engaged in the adaption of this very versatile raw material to industrial uses; for it is self-evident that the more there is known regarding the properties of a substance, the more readily the same can be applied to a particular purpose.

The average non-technical reader, however, will probably find a good part of this to be "over-his-head." As the detailed information is supported by a good bibliography, the investigator is able to refer to the original articles if need be, so from this point of view also the book is very valuable.

Now as regards the practical side. Chapter 7 deals wtih the Technical Preparation of Casein. This is given in full detail, with a number of illustrations showing the machinery required. The removal of impurities and butter fat, precipitation of curd by various reagents, as well as by natural souring and by rennin are discussed, including methods of factory control. The question of cost of manufacture, price of products and kindred subjects are also gone into. As compared with imported Argentine casein, it appears that the price in New York for the domestic product (1925) is 5.47 cents per pound, as against only 5.04 for the South American. The violent fluctuation of the price of casein is mentioned.

Methods of analysis, government specifications and other tests complete this chapter.

Chapter 8 takes up the technical uses of casein, such as Adhesives, use in the paper industry, plastics, paints, use in textile industry, in foods, medicines and various proprietary articles as base of creams, pomades, shoe polish, etc. Obviously such a diversified field can only be covered in the merest outline, and there is no pretense at completeness or detail in this section. However, that is not the purpose of the volume, its main object being to furnish information on the properties of the casein.

A chapter of the Patents on Casein is included, but as stated in a footnote only the more important patents are given, so that any search in the art would have to go beyond thescope of the book. The bibliography already mentioned, and an index complete the volume.

Inasmuch as the casein plastic industry, and in fact the utilization of casein in all its forms, is rapidly growing, and many are contemplating entering this field, it is felt that Dr. Tague's work will be highly welcome and will fill a decided need.

**Remember!**

Any book reviewed in PLASTICS can be obtained by writing to our

**Book Dept.**

**471 4th Ave.,**
**New York City**

## Percussion Performing Press

(*Continued from page 409*)

double percussion thrust, which produces a more gradual compression, or squeeze. The basis for the claim seems reasonably lodged in the fact that after the punch block has landed it is followed by the main blow of the descending screw which produces a final compression undoubtedly resulting in a further elimination of confined air, and the production of a more homogeneously solid cake.

From the standpoint of construction many other points might be mentioned. For instance, the drive of the horizontal disc (descending) is of course transmitted on a circle of constantly increasing diameter on the vertical disc, and therefore the maximum energy is available when the disc is at its lowest position upon delivery of the blow. Moreover, if desired, the force of the blow delivered can be diminished by building up the die so that the maximum "circle of drive" on the vertical disc is made smaller. Another feature is that emergency stops prevent the plunger thread being screwed off or the press head broken in case the press is allowed to operate without a die in position; also bumpers are provided to cushion shock on the press when the punch rises on its upward motion. The horizontal disc's friction belt is of chrome-tanned leather, and is usually good for a year or more, without replacement.

### Efficiency of Operation

It may be argued that the percussion press requires the constant attention of an operator, while other devices in similar service are largely automatic. In answer to this it may be stated that with a skilled operator the production with the percussion press can be made to equal that of the usual auto-tamping thrust, it delivers a

matic briquetting machine. Moreover, although the latter are automatic in operation, nevertheless, most molding plants have found that they require at least part of the time of a workman if only to give occasional attention. Then too, it is often desirable that the percussion press be operated by hand if there is necessity of changing dies frequently when molded parts of new design are to be produced. In some cases it would not be practical to make constant readjustments of feed if an automatic machine were used.

It is, however, entirely possible to make the Z. & H. press completely automatic, and it is understood that the company manufacturing them will execute such automatic machines for plastic molders whose constant production requirements make such equipment especially indispensible.

### Opinions of Users

At the Memco Electric Manufacturing Company, where a 75 ton Z. & H. press is installed, they are able to get 3,000 strokes per day, forming 1 3-8 inch discs of Bakelite in a 12-cavity die, while their average operations might be stated as 500 strokes per hour, with a 9-cavity die. They state that such a press can be used for preforming pieces of almost any size practical for molding purposes. At the Kurz-Kasch Company plant, in Dayton, Ohio, they are able to make thirty 3⅝" tablets per minute, using a 2-impression die. This is a fairly large size tablet, but it should be realized that with the percussion type of press the making of large-size tablets offers no special difficulty—a very fortunate fact inasmuch as there is an increasing tendency to use Bakelite for larger and larger molded objects.

Because of its sturdy construction this new type of preforming press will undoubtedly find extensive use in molding large parts.

### Sun-Spex Spectacles

A novelty in anti-glare spectacles has recently been offered. This consists in a pyroxylin plastic spectacle made entirely from a single thin sheet of the material, which is punched out in the conventional form, the bridge and lenses all being of the same material.

The temples are furnished separate, also stamped from the same sheet, and are attached by the user by drawing them through two slots placed at the outer edge of the lenses. Means for varying the length of the temples, by cutting off certain small lugs on the same, are provided. As the whole object can be made by very simple operations, it provides an article that can be sold profitably for as little as five cents, and should prove a good seller during next summers sea-shore and golf season. As the specs are very light, they can be worn over the regular eyeglasses if the wearer so desires. This is another attractive feature. Patents have been applied for.



# LIST OF USEFUL BOOKS

**Technology of Cellulose Esters, Vol. 1.**

4083 pages in 5 parts

By E. C. Worden, 1920.

Illustrated, $40.00.

It would require an entire issue of Plastics to adequately describe this work, which is the only complete bibliographic compilation of this art extant. Vol. I deals with Cellulose, Cotton, Sulfuric and Nitric Acid, mixed acids, the nitration of cellulose and stabilization of the cellulose nitrates.

Part 4 is a bibliography, carefully classified, giving all the published and patented uses of the various cellulose esters such as the nitrate, acetate, etc., as well as the cellulose ethers and substitutes for pyroxylin plastics.

---

**Casein. Its Preparation, Chemistry and Technical Uses**

E. L. Tague, 205 pp., $3.00, 1926.

A comprehensive review of the casein industry. Reviewed in the present issue of Plastics, pp. 411.

**Plastics and Molded Electrical Insulation.**

Emile Hemming. 313 pages. Illustrated. $6.00.

Very special care has been taken in the preparation of the chapter of molded insulation. Contains hundreds of references to plastic and composition products and their utilization.

**Celluloid.**

Its raw material, manufacture, properties and uses.

Dr. Fr. Bockmann. 188 pages. 69 illustrations. $3.50.

In this book, the raw product, cellulose and its properties are thoroughly described. Other raw materials and methods of rendering them more plastic also occupy attention.

**Pyroxylin Enamels and Lacquers.**

Samuel P. Wilson. 213 pages. Illustrated. $3.00.

An authorative work dealing with the materials and manufacture of pyroxylin solutions and with their application in the industry.

**Cellulose Ester Varnishes.**

F. Sproxton. 1925. $4.50.

An exceptionally well-written book on the general subject of the cellulose ester lacquers. Up-to-date and sufficiently non-technical to be of inestimable use to manufacturers.

**Synthetic Resins and their Plastics.**

Carleton Ellis. 514 pages, illustrated. $8.00.

The book will serve as a guide and prove a stimulus to the numerous investgiators and practitioners in the field of artificial resins. The section of plastic molding is especially valuable.

Any of the above can be obtained by writing to

**Book Department**
**PLASTICS**
**471 4th Ave., New York**

*Every plant or fabricating establishment needs all the books on the subject of its manufacture that it can obtain. Remember "Knowledge is power."*

# The Versatility of Pyroxylin

(*Continued from page 388*)

Sheets, stained
Shirt bosom fronts
Shoe bottom fillers
Shoe caps
Shoe enamels
Shoe eyelets
Shoe fastener
Shoe lasts
Shoe patches
Shoe stiffeners
Shoe tips
Signs
Skirt fastener
Small boats
Soap dish
Soap holder
Soap tablet float
Spangles
Spectacle frames
Speculum
Spinning tops
Squeegees
Stamps
Stays
Stereotype
Stethoscope
Stones inlaid
Storage acid in vessels coated
Studs
Substratum for paper
Sunshade tips
Support for maps
Surgical splints
Surgical uses
Suspensory bandages
Suture plate
Syringes

**Tampon introducers**
Tennis balls
Tennis racquets
Thermometer protectors
Thimble
Thimble blank
Thread
Thread reels
Tire rims
Tongue depressor
Tooth brush
Tooth brush case
Toothpicks
Toothpick case
Tortoise shell
Toupee
Toys
Transfers
Transparencies
Transparent package
Transparent screens
Trays
Trephining apparatus
Trusses
Tubes
Typewriter ribbons

**Umbrella Tips**

**Vaccine shields**
Varnishes
Vehicle frame coatings
Velocipede handles
Veneering
Violin mutes
Violin tailpieces

**Waist fastener**
Watch crystal
Waterproofing
Waterproofing collars
Waterproofing paper
Waterproofing sweatbands
Wigs
Wound shields
Wristlet
Wrist watch protector

---

It should thus be obvious that the commercial utilization of the pyroxylin plastics has been most thorough.

We hope before very long to be able to publish a similar alphabetic list of the uses of the phenol and other synthetic resins; as well as a list for the casein plastics. If you are making any unusual object out of any of these products, advise us of it and get on the list.

## Sparks from turning machine fires pyroxylin

Shortly after 5 P. M. October 7, fire broke out at the plant of the Cellu Products Co. The loss was at least $5,000, probably more.

Charles A. Racine, an employe, discovered the fire, which apparently started from a machine, and tried to put it out, receiving lacerations on both hands.

When the fire got under way, the sprinklers began working and subdued the flames considerably, but it was necessary for the firement to use three water lines. Work of locating the exact position of the fire was hampered by dense smoke which poured from doors and windows.

Practically all of the employes had left the building when the fire started. Mr. Racine was working overtime upon a turning machine from which a celluloid spark was thrown that caused the fire.

Robert I. Greenlaw owns the Cellu Products Co., which manufactures celluloid novelties.

# Accessories
## For Toilet Articles



## PLASTICS MOVES TO NEW QUARTERS

To have sufficient room for expansion for some years to come, PLASTICS has moved its editorial headquarters to 471 4th Ave., New York, where the entire 5th floor of this building is available for enlargement.

This was directly caused by the remarkable growth of the organization and thanks is due our subscribers and advertisers who so well supported us.

### Knighted

It may interest fabricators of pyroxylin plastic novelties and jewelry to learn that nobility resides in their midst.

Mr. Geo. F. Berkander, of Providence, R. I., well known in this trade, has recently been knighted by the King of Sweden.

---

Statement of ownership, management, circulation, etc., required by the Act of Congress of August 24, 1912, of Plastics published monthly at Washington, N. J., for October 1, 1926.

State of New York, County of New York, ss.: Before me, a Notary Public in and for the state and county aforesaid personally appeared Sylvan Hoffman, who, having been duly sworn according to law, deposes and says that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and businses managers are:

Publisher, Sylvan Hoffman, 471 Fourth Avenue, New York City; editor, Carl Marx, 471 Fourth Avenue, New York City; business manager, Harry Schwartzschild, 471 Fourth Avenue, New York City.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Neckwear Publishing Co., Sylvan Hoffman Della Hoffman, Mary Greenberg, Harry Schwartzschild, all of 471 Fourth Avenue, New York City, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding one per cent of total amount of bonds, mortone per cent of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full is given; also that the said two paragraphs knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

SYLVAN HOFFMAN,
(Signature of Publisher)

Sworn and subscribed before me this 21st day of October, 1926.

(SEAL) ARTHUR V. MOORE,
Notary Public.

My commission expires March 30, 1928.



### Sage Resigns as Rochester Button President

Rochester, N. Y. — Nelson Sage, president of the Rochester Button Co., Inc., tendered his resignation to the board of directors of the company on October 11, to take effect immediately. The resignation of Mr. Sage was prompted by the necessity to devote more time to his personal affairs.

Mr. Sage will retain his stock interest in the corporation, as well as his membership on the board of directors. He will be succeeded by H. R. Peck, who has been assistant to the president of the National Products Corporation of New York. Mr. Peck formerly was a member of the firm of W. S. Peck & Co., of Syracuse.

# BUYERS' GUIDE

**ABRASIVES**
Nulite Polish Co.
**ACCUMULATORS**
The Burroughs Co.
The Dunning & Boschert Press Co. Inc.
Hydraulic Press Mfg. Co.
The Adamson Machine Co.
Chas. F. Elmes Engineering Works
French Oil Machinery Co.
A. B. Farquar
**ALADDINITE**
Aladdinite Co.
**ARTIFICIAL HORN**
Aladdinite Chemical Products Co.
Erinoid Co.
American Machine & Foundry Co.
Karolith Corp.
General Plastics Co.
**BAKELITE**
Bakelite Corporation
**BLEACHED SHELLAC**
Kasebier-Chatfield Shellac Co.
**BOILERS**
Syracuse Steam Generator, Inc.
**CAMPHOR (Synthetic)**
C. B. Peters Co.
**CASEIN PLASTICS**
Aladdinite Chemical Products Co.
Karolith Corp.
Erinoid Co.
American Machine & Foundry Co.
**CELLULOID SCRAP**
Johnson Products Co., Inc.
Browning Pyroxylin Products Corp.
**CELLULOSE ACETATES**
American-British Chemical Supplies, Inc.
Jos. H. Meyer Bros.
**COTTON FLOCK**
Peckham Mfg. Co.
**DIES**
Standard Tool Co.
Leominster Tool Co.
**DUREZ**
General Plastics Co.
**ERINOID**
Erinoid Co.
**FILLERS**
Geo. H. Lincks
C. B. Peters
**FITTINGS—HIGH PRESSURE**
Hydraulic Press Mfg. Co.
French Oil Machinery Co.
A. B. Farquar
**GLASS, SILVERED**
Standard Mirror Co.
Tassi Bros.
**GUMS**
Geo. H. Lincks
**HYDRAULIC EQUIPMENT**
Evarts G Loomis Co.
Hydraulic Press Mfg. Co.
The Adamson Machine Co.
Terkelsen Machine Co.
Burroughs Co., The,
Watson-Stillman Co.
Chas. F. Elmes Engineering Works
Southwark Foundry & Mach. Co.
Dunning & Boschert Press Co.
French Oil Mill Machinery Co.
Metalwood Mfg. Co.
A. B. Farquar
**INDA**
American Machine & Foundry Co.
**INSULATION**
Bakelite Corporation
**KAROLITH**
Karolith Corp.
**LABELS**
Economy Ticket & Label Co.
**MACHINERY**
Standard Tool Co.
Leominster Tool Co.
**MEASURING MACHINES**
F. J. Stokes Mach. Co.
**MIRRORS**
Standard Mirror Co.
Tassi Bros.
**MOLDING**
Rawson Molding Co.
George Morrell, Inc.
**MOLDING MATERIALS**
Bakelite Corporation
**MOLDS**
The Burroughs Co.
**NON-INFLAMMABLE MATERIAL**
Erinoid Co.
Karolith Corp.
Aladdinite Co.
American Machine & Foundry Co.
**PEARL COATING**
Aurora Pearl Co.
Jos. H. Meyer Bros.
Paispearl Co.
Geo Morrell, Inc.
**PHENOL RESIN**
Bakelite Corporation
**POLISHES**
Nulite Polish Co.
**PRESSES—BAKELITE**
F. J. Stokes Mach. Co.
Hydraulic Press Mfg. Co.
Burroughs Co., The,
Chas. F. Elmes Engineering Works
Dunning & Boschert Press Co.
French Oil Mill Machinery Co.
Metalwood Mfg. Co.
A. B. Farquar
**PRESSES—HYDRAULIC**
The Burroughs Co.
Evarts G. Loomis Co.
Hydraulic Press Mfg. Co.
Terkelsen Machine Co.
Watson-Stillman Co.
Chas. F. Elmes Engineering Works
Dunning & Boschert Press Co.
French Oil Mill Machinery Co.
Metalwood Mfg. Co.
A. B. Farquar
**PUMPS—HYDRAULIC**
The Dunning & Boschert Press Co. Inc.
Hydraulic Press Mfg. Co.
Chas. F. Elmes Engineering Works
French Oil Mch. Co.
Metalwood Mfg. Co.
A. B. Farquar
**PYROXYLIN PLASTICS**
Nixon Nitration Works
Jos. H. Meyer Bros.
H. A. Cook Co.
Browning Pyroxylin Products Corp.
American Celutex Corp.
E. W. Wiggins
**PYROXYLIN PRODUCTS**
H. A. Cook Co.
Nixon Nitration Works
Jos. H. Meyer Bros.
American Celutex Corp.
E. W. Wiggins
**RECLAIMERS**
Johnson Products Co., Inc.
Browning Pyroxylin Products Corp.
**ROLLING MACHINERY**
Evarts G. Loomis Co.
**SCRAP**
Johnson Products Co., Inc.
**SHELLAC**
Kasebier-Chatfield Shellac Co.
Geo. H. Lincks
**SWING JOINTS**
Burroughs Co., The,
Evarts G. Loomis Co.
French Oil Machinery Co.
Hydraulic Press Mfg. Co.
**TOOLS**
Standard Tool Co.
Leominster Tool Co.
**TURNERS**
Geo Morrell, Inc.
**WOOD FLOUR**
Becker Moore Co.

This is a carefully classified index of concerns who specialize in this industry and who advertise regularly in PLASTICS. Please mention PLASTICS when writing to these firms.

# NIXONOID

OUR
PRODUCTION
IS
CONFINED
TO
SHEETS AND RODS

*We Do Not Manufacture*
*Articles*

Our Representative
Will Gladly Call at Your Request

## NIXON NITRATION WORKS
## NIXON
## NEW JERSEY

New England Representative
E. W. Wiggins
Leominster, Mass.

Southern Representative
E. N. Phillips
134 W. Commerce St., High Point, N. C.